WHAT IS CLAIMED IS:

1. An RFID system comprising:

(A) a plurality of RFID transponders, each of said plurality of RFID transponders having a unique identification code, for receiving a signal and for generating a response signal based thereon, each of said RFID transponders having a random number generator used for determining whether to respond to a received message addressed to all of said plurality of RFID transponders;

(B) a host computer for generating a message for transmission to at least one of said RFID transponders; and

(C) at least one interrogator connected to said host computer having an interrogator transmitter and an interrogator receiver which operate in half-duplex mode, wherein said interrogator transmitter transmits messages received from said host computer to said plurality of RFID transponders during a first part of said half-duplex mode and which provides an illumination signal to said plurality of RFID transponders during a second part of said half-duplex mode and said interrogator receiver receives signals reflected by said at least one RFID transponders and provides said received signals to said host computer;

wherein said host computer identifies each of said unique identification codes associated with each of said plurality of RFID transponders by iteratively transmitting a message including a variable having a predetermined initial value to each of said RFID transponders, and only said RFID transponders which generate a random number greater than said variable respond to said message by transmitting identification codes associated with said respective RFID transponders.

2. The RFID system of Claim 1, wherein each of said signals is transmitted in spread spectrum format.

3. The RFID system of Claim 1, wherein communications between said at least one interrogator and each of said plurality of RFID transponders is in TDMA format whereby a predetermined number of time slots are available for transmission.

4. The RFID system of Claim 3, wherein each of said RFID transponders which generate a random number greater than said variable also use said generated random variable to determine which time slot to use for transmission of said response signal.

5. The RFID system of Claim 1, wherein said host computer intelligently adjusts said variable after receipt of each response signal to ensure that an adequate number of responses are received during a next iteration.

6. The RFID system of Claim 1, wherein said random number generator is also used for generating a unique identification code for each of said plurality of RFID transponders.

7. A method for a host to read an identification code from a plurality of RFID transponders each having unique identification codes, comprising the steps of:

(A) iteratively transmitting a read identification code command and a variable having a predetermined initial value from said host to said plurality of RFID transponders;

(B) receiving, at each of said plurality of RFID transponders, said read identification code command and said variable;

(C) generating, at each of said plurality of RFID transponders, a random number upon receipt of said read identification code and said variable;

(D) comparing, at each of said plurality of RFID transponders, said variable with said generated random number;

(E) transmitting, by each of said RFID transponders where said generated random number is greater than said variable, an identification code associated with each RFID transponder and then becoming inactive such that each RFID transponder does not respond to further read identification code commands during a current read identification code command iteration;

(F) waiting, by each of said RFID transponders where said generated random number is not greater than said variable, for a next transmission of said read identification code command and said variable;

(G) intelligently adjusting, by said host, the value of said variable for the next transmission of said read identification code command and said variable; and

(H) examining said variable at said host and ceasing the iterative transmission of said read identification code command when no RFID transponders respond by transmitting their identification code in response to a final value of said variable.

8. The method of Claim 7, wherein said predetermined value for said variable is set as a high value, said step of intelligently adjusting the value of said variable reduces the value of said variable, and wherein said final value is zero.

9. A method for re-selecting an identification code for each of a plurality of RFID transponders, comprising the steps of:

(A) transmitting a re-select identification code command to each of a plurality of RFID transponders;

(B) generating, at each of said plurality of RFID transponders, a first random number and calculating a new identification code based upon said random number;

(C) iteratively transmitting a read identification code command and a variable having a predetermined initial value from said host to said plurality of RFID transponders;

(D) receiving, at each of said plurality of RFID transponders, said read identification code command and said variable;

(E) generating, at each of said plurality of RFID transponders, a random number upon receipt of said read identification command and said variable;

(F) comparing, at each of said plurality of RFID transponders, said variable with said generated random number;

(G) transmitting, by each of said RFID transponders where said generated random number is greater than said variable, an identification code associated with each RFID transponder and then becoming inactive such that each RFID transponder does not respond to further read identification code commands during a current read identification code command iteration;

(H) waiting, by each of said RFID transponders where said generated random number is not greater than said variable, for a next transmission of said read identification code command and said variable;

(I) intelligently adjusting, by said host, the value of said variable for the next transmission of said read identification code command and said variable; and

(J) examining said variable at said host and ceasing the iterative transmission of said read identification code command when no RFID transponders respond by transmitting their identification code in response to a final value of said variable.

10. The method of Claim 9, wherein said predetermined value for said variable is set as a high value, said step of intelligently adjusting the value of said variable reduces the value of said variable, and wherein said final value is zero.

11. An interrogator for communicating with an RFID transponder in an RFID system which is connected to a host computer, comprising:

(A) at least one antenna;

(B) a transmitter connected to said at least one antenna for transmitting an FSK modulated spread spectrum signal on said at least one antenna during a transmitting mode and a BPSK modulated spread spectrum signal during a receiving mode;

(C) a receiver connected to said at least one antenna for receiving a spread spectrum signal in PSK format, and

(D) a controller connected to said transmitter and said receiver for controlling said transmitter and said receiver and communicating with a host computer.

12. The interrogator of Claim 11, wherein said at least one antenna comprises a first antenna having a first polarization and a second antenna having a second polarization which is orthogonal to said first polarization, and further comprising an antenna switch matrix for selecting one of said first antenna and second antenna for connection to said transmitter and a second of said first antenna and said second antenna for connection to said receiver.

13. The interrogator of Claim 12, wherein said at least one antenna further comprises a third antenna having a third polarization which is orthogonal to said first polarization and to said second polarization, and said antenna switch selects one of said first antenna, second antenna and third antenna for connection to said transmitter and a second of said first antenna, second antenna and third antenna for connection to said receiver.

14. The interrogator of Claim 11, wherein said transmitter comprises:

an FSK transmitter section for generating a message for transmission as a spread spectrum output signal in FSK format;

a BPSK transmitter section for generating an illumination signal for transmission as a spread spectrum signal in BPSK format;

an output amplifier; and

a switch which selectively connects said FSK transmitter section or said BPSK transmitter section to said output amplifier.

15. The interrogator of Claim 14, wherein said FSK transmitter section consists of:

a Manchester encoder connected to said controller;

a PN generator connected to said controller; and

an FSK modulation generator connected to said Manchester encoder and said PN generator.

16. The interrogator of Claim 14, wherein said BPSK transmitter section consists of:

a PN generator;

a low noise oscillator; and

a balanced modulator connected to said PN generator and said low noise oscillator.

17. The interrogator of Claim 11, wherein said receiver comprises:

a band pass filter having an input connected to said at least one antenna for receiving a signal;

a first mixer and a second mixer each having a first input connected in parallel to an output of said band pass filter and a second input connected to a signal derived from a transmitted signal;

a first bandpass filter connected to an output of said first mixer;

a first data and clock recovery circuit connected to an output of said first bandpass filter for recovering an in-phase version of said received signal;

a second bandpass filter connected to an output of said second mixer; and

a second data and clock recovery circuit connected to an output of said second bandpass filter for recovering an quadrature-phase version of said received signal.

18. An antenna assembly for an RFID interrogator comprising:

(A) a first antenna having a first polarization;

(B) a second antenna having a second polarization which is orthogonal to said first polarization; and

(C) an antenna switch network connected to said first and second antennas for selectively selecting one of said first and said second antennas for connection to a transmitter.

19. The antenna assembly of Claim 18, further comprising a third antenna having a third polarization which is orthogonal to both said first polarization and said second polarization.

20. A transponder for communicating with an interrogator in an RFID system, comprising:

(A) a first antenna element having a first predetermined dimensional configuration;

(B) a second antenna element having a second predetermined dimensional configuration;

(C) an impedance modulator connected between said first antenna element and said second antenna element which causes said first antenna element to be electrically connected to said second element in a first state and to be electrically isolated from said second element in a second state;

(D) a receiver for receiving a message within an FSK modulated spread spectrum signal connected to said first antenna element, said second antenna element and said impedance modulator; and

(E) a controller connected to said receiver which receives said message and selectively responds to said message in PSK format by reflecting an illumination signal transmitted by said interrogator by selectively switching said impedance modulator between said first state and said second state.

21. The transponder of Claim 20, wherein said receiver comprises:

(A) a frequency discriminator having an input connected to said first and second antenna elements;

(B) a bandpass quantizer having an input connected to an output of said frequency discriminator; and

(C) a low pass filter connected to an output of said bandpass quantizer.

22. The transponder of Claim 20, wherein said first predetermined dimensional configuration is a length of one-quarter wavelength and said second predetermined dimensional configuration is a length of three-quarter wavelength.

23. The transponder of Claim 22, wherein said first antenna element consists of two first sub-elements connected by a ninety degree angle.

24. The transponder of Claim 23, wherein each of said first sub-elements have a predetermined length relationship to each other.

25. The transponder of Claim 22, wherein said second antenna element consists of a plurality of second sub-elements connected by ninety degree angles in a geometrically folding configuration.

26. The transponder of Claim 25, wherein each of said second sub-elements have a predetermined length relationship to each other.

27. The transponder of Claim 20, wherein said first antenna element and said second antenna element together form a dipole configuration.

28. A method of generating a random number in an RFID transponder, comprising the steps of:

(A) calculating a random seed based upon the difference between a local clock signal and a clock signal derived from either a received signal or random noise;

(B) supplying said random seed to a random number generator; and

(C) generating a random number based upon said random seed.

29. An apparatus for generating a random number, comprising:

(A) a first clock input derived from a local clock oscillator;

(B) a second clock input derived from a received signal or random noise;

(C) means connected to said first clock input and said second clock input for generating a random number based upon the timing difference between said first clock input and said second clock input.

30. A method for controlling a plurality of groups of interrogators in an RFID system, comprising the steps of:

arranging each interrogator within a group of interrogators in nearest neighbor format having a predetermined order; and

activating only corresponding interrogators within each group of interrogators for transmission of signals to at least one RFID transponder within a zone covered by said respective activated interrogators.

31. A method for generating a unique identification code for each of a plurality of RFID transponders originally having a common default identification code, comprising the steps of:

(A) transmitting a re-select identification code command to each of a plurality of RFID transponders;

(B) generating, at each of said plurality of RFID transponders, a first random number and calculating a new identification code based upon said random number;

(C) iteratively transmitting a read identification code command and a variable having a predetermined initial value from said host to said plurality of RFID transponders;

(D) receiving, at each of said plurality of RFID transponders, said read identification code command and said variable;

(E) generating, at each of said plurality of RFID transponders, a random number upon receipt of said read identification code and said variable;

(F) comparing, at each of said plurality of RFID transponders, said variable with said generated random number;

(G) transmitting, by each of said RFID transponders where said generated random number is greater than said variable, an identification code associated with each RFID transponder and then becoming inactive such that each RFID transponder does not respond to further read identification code commands during a current read identification code command iteration;

(H) waiting, by each of said RFID transponders where said generated random number is not greater than said variable, for a next transmission of said read identification code command and said variable;

(I) intelligently adjusting, by said host, the value of said variable for the next transmission of said read identification code command and said variable; and

(J) examining said variable at said host and ceasing the iterative transmission of said read identification code command when no RFID transponders respond by transmitting their identification code in response to a final value of said variable.

32. The method of Claim 31, wherein said predetermined value for said variable is set as a high value, said step of intelligently adjusting the value of said variable reduces the value of said variable, and wherein said final value is zero.

33. A method for a host having a plurality of transmitting antennas to read an identification code from a plurality of RFID transponders each having unique identification codes, comprising the steps of:

(A) iteratively transmitting a read identification code command and a variable having a predetermined initial value from said host to said plurality of RFID transponders on each of said plurality of transmitters;

(B) receiving, at each of said plurality of RFID transponders, said read identification code command and said variable;

(C) generating, at each of said plurality of RFID transponders, a random number upon receipt of said read identification code and said variable;

(D) comparing, at each of said plurality of RFID transponders, said variable with said generated random number;

(E) transmitting, by each of said RFID transponders where said generated random number is greater than said variable, an identification code associated with each RFID transponder and then becoming inactive such that each RFID transponder does not respond to further read identification code commands during a current read identification code command iteration;

(F) waiting, by each of said RFID transponders where said generated random number is not greater than said variable, for a next transmission of said read identification code command and said variable;

(G) receiving at said host said transmitted identification codes associated with particular RFID transponders and storing said identification codes and associated antenna information in memory so that further communication with a particular one of said plurality of transponders is performed by using said identification code and said antennal information;

(H) intelligently adjusting, by said host, the value of said variable for the next transmission of said read identification code command and said variable; and

(I) examining said variable at said host and ceasing the iterative transmission of said read identification code command when no RFID transponders respond by transmitting their identification code in response to a final value of said variable.

34. An RFID system for tracking election ballots comprising:

(A) a plurality of RFID transponders, each of said plurality of RFID transponders having a unique identification code and connected to a separate ballot, for receiving a signal and for generating a response signal based thereon, each of said RFID transponders having a random number generator used for determining whether to respond to a received message addressed to all of said plurality of RFID transponders and a memory for storing election data;

(B) a host computer for generating a message for transmission to at least one of said RFID transponders and for controlling the storage of election data within each of said ballots; and

(C) at least one interrogator connected to said host computer having an interrogator transmitter and an interrogator receiver which operate in half-duplex mode, wherein said interrogator transmitter transmits messages received from said host computer to said plurality of RFID transponders during a first part of said half-duplex mode and which provides an illumination signal to said plurality of RFID transponders during a second part of said half-duplex mode and said interrogator receiver receives signals reflected by said at least one RFID transponders and provides said received signals to said host computer;

wherein said host computer identifies each of said unique identification codes associated with each of said plurality of RFID transponders by iteratively transmitting a message including a variable having a predetermined initial value to each of said RFID transponders, and only said RFID transponders which generate a random number greater than said variable respond to said message by transmitting identification codes associated with said respective RFID transponders.

35. The RFID system of Claim 1, wherein said host computer selectively transmits a predetermined message which causes each RFID transponder receiving said predetermined message to transmit its identification code to said host computer.

36. The RFID system of Claim 35, wherein said predetermined message is continuously transmitted by said host computer and whereby receipt of said identification code by said host signals an alarm event.

37. In a communications system having a first device having a transmitter and a receiver and a plurality of second devices, each of said second devices having a transmitter and a receiver, where communications between said first device and said plurality of second devices is in TDMA format having a plurality of time slots for transmission, a method for determining if more than one second device has transmitted a signal to said first device at the same time during a current TDMA communications period, comprising the steps of:

(A) sampling the relative power in an analog baseband channel of said receiver in said first device during each of said time slots;

(B) sampling the relative power in an analog baseband channel of said receiver in said first device during a period of no communications;

(C) comparing said sampled relative power in each of said time slots to said sampled relative power in said period of no communications;

(D) setting, if said comparison for a particular one of said time slots produces a value of greater than unity by a predetermined amount, said particular time slot to be occupied;

(E) determining which of said time slots did not have an accepted message;

(F) comparing said time slots which did not have an accepted message to said occupied time slots;

(G) determining that each of said time slots which did not have an accepted message and which is occupied represents a time slot in which more than one second device transmitted a message at the same time.

38. The interrogator of Claim 17, wherein said first data and clock recovery circuit comprises a first digital discrete phase lock loop circuit that synchronizes to first signals input to said first data and clock recovery circuit, said second data and clock recovery circuit comprises a second digital discrete phase lock loop circuit that synchronizes to second signals input to said first data and clock recovery circuit, and said controller chooses between said in-phase version of said received signal and said quadrature-phase version of said received signal based upon which of said first and second digital discrete phase lock loop circuit first synchronizes to said first and second input signals, respectively.